REMARKS

The Examiner's Office Action dated December 20, 2002 has been received and its contents carefully noted. The Applicants respectfully submit that this response is timely filed and fully response to the Office Action. By the above amendments, claims 4, 7, 8, 9, 11 and 12 have been amended, and claims 1-3, 5, 6, 10 and 13 have been cancelled. Consequently, claims 4, 7, 8, 9, 11 and 12 are currently pending. Support for the presently claimed subject matter is as follows:

Claim 4 is supported by page 25, line 10, to page 26, line 2,

Claim 7 is supported by page 6, lines 4-11,

Claim 8 is supported by page 41, lines 2-8,

Claim 11 is supported by page 30, line 25, to page 31, line 10,

Claim 12 is supported by page 33, lines 10-22, of the specification.

In light of the above amendments and detailed arguments to follow, reconsideration of the currently proposed rejections, including the rejection of claim "9-12" (which apparently should have been claims 10-12), under § 112 (second paragraph), is respectfully requested.

With regard to the other rejections of:

Claims 1-3, 6, 8 and 13, under 35 U.S.C. 102(e), as being anticipated by the teachings of Nakamura et al. (US 2002/0167018),

Claims 4 5 and 7, under 35 U.S.C. 103(a), as being obvious in view of the teachings of Nakamura et al. (US 2002/0167018) combined with the teachings of Ono et al. ('835), and

Claims 11 and 12, under 35 U.S.C. 103(a), as being obvious in view of the teachings of Nakamura et al. (US 2002/0167018) combined with the teachings of the Chen et al. (J. of Appl. Physics) article,

each of these rejections is respectfully traversed.

The presently claimed invention of independent claim 4 sets forth the features that the etching stop layer functions as a reflective mirror and is composed of a super lattice layer obtained by alternating layers of $Al_xGa_{1-x}N$ and $Al_yGa_{1-y}N$, and a thickness of each $Al_xGa_{1-x}N$ layer and each $Al_yGa_{1-y}N$ layer is $\lambda / (4n)$ (where, λ denotes an oscillation wavelength of the semiconductor laser optical device, and n denotes a refractive index of each $Al_xGa_{1-x}N$ layer and each AlyGa1-yN layer). With this configuration, the super lattice layer becomes the Bragg reflector mirror during light-emission of the semiconductor laser optical device, and leakage of light from the active layer to the outside can be prevented.

The presently claimed invention of independent claim 7 sets forth the feature that the etching stop layer is made of an insulating film composed of silicon nitride in order that the etching selectivity ratio between the silicon nitride and the second semiconductor layer can be increased, thereby improving the etching controllability for the second semiconductor layer.

The presently claimed invention of independent claim 8 sets forth the features the etching stop layer and the first semiconductor layer include magnesium, and the amount of magnesium included in the etching stop layer is more than an amount of magnesium included in the first semiconductor layer.

The presently claimed invention of independent claim 11 sets forth the features that the amount of Al included in the etching stop layer is more than the amount of Al included in the second semiconductor layer, the wavelength of the photoluminescence light is emitted through excitation by the laser beam, and, by utilizing the differences caused by the composition of the surface on which the laser beam is irradiated, it is assumed (determined) the surface of the etching stop layer has been exposed when the wavelength of the photoluminescence light is shortened.

The presently claimed invention of independent claim 12 sets forth the features that the amount of Al included in the etching stop layer is more than the amount of Al

included in the second semiconductor layer, the diffraction angle is measured when the X ray irradiated, and by utilizing the differences caused by the composition of the surface on which the X ray is irradiated, it is assumed (determined) that the surface of the etching stop layer has been exposed when the diffraction angle increases.

Neither Nakamura et al. (US2002/0167018 A1) (hereinafter "Nakamura"), Ono (U.S. Patent No. 5,757,835) (hereinafter "Ono") and/or the Chen et al. article (hereinafter "Chen"), teach or suggest each of the above features of claims 4, 7, 8, 11 and 12.

With regard to claim 4, Nakamura fails to disclose the super lattice layer specifically claimed; while Ono (which is not discussed at all by the Examiner's rejection of claims 4, 5 and 7 under § 103(a)) teaches using a super lattice layer as an etching stop layer, but fails to teach or suggest that by setting the thickness of each layer of the alternating layers forming the super lattice layer to $\lambda / (4n)$ the super lattice layer becomes a reflective mirror when the semiconductor laser optical device is emitted.

Further, according to the amended claim 4, leakage of light from the active layer to the outside can be prevented when the etching stop layer is used as a reflective mirror composed of the super lattice layer. However, Ono also fails to discuss the leakage of light from the active layer. Since both Nakamura and Ono fail to disclose the above features of amended claim 4, a *prima facie* case of obviousness has not been set forth under § 103(a), and claim 4 is therefore patentable over Nakamura and Ono, either individually or in combination.

With regard to amended claim 7, the etching stop layer is made of an insulating film composed of silicon nitride. Indeed, it is well known that in order to achieve an n-type semiconductor having GaN as a main constituent, the semiconductor is doped with Si. However, it is also well known that such Si doped GaN is conductive. Hence, even if the semiconductor disclosed in Nakamura and Ono has GaN as a main constituent, and is doped with Si in order to obtain an n-type semiconductor, the semiconductor does not

become an insulating film as presently claimed. Since both Nakamura and Ono fail to disclose the above features of amended claim 7, a *prima facie* case of obviousness, under § 103(a), has not been set forth, and claim 7 is therefore patentable over Nakamura and Ono, either individually or in combination.

With regard to amended claim 8, the amount of magnesium included in the etching stop layer is more than an amount of magnesium included in the first semiconductor layer. However, Nakamura, at paragraph [0048], discloses that the density of Mg included in the etching stop layer (17) is $1 \times 10^{18}cm^{-3}$, which is the same as that included in the second p-type cladding layer (11). Further, the density of Mg included in the p-type contact layer (10) deposited on the second p-type cladding layer (11) is $5 \times 10^{18}cm^{-3}$, which is more that included in the etching stop layer (17). Nakamura also fails to disclose utilizing the differences in the amount of Mg to differentiate the etching rate. Therefore, since Nakamura fails to disclose the presently claimed difference in the amount of magnesium included in the etching stop layer and the first semiconductor layer as set forth in claim 8, anticipation is not established with regard to claim 8 by the Nakamura reference. Hence, the presently amended claim 8 is patentable over Nakamura.

Further, neither Ono or the Chen article disclose or suggest the claimed Mg density of the layers of the presently amended claim 8. Therefore, the amended claim 8 is patentable over Nakamura, Ono and Chen either individually or in combination.

With regard to amended claim 11, by utilizing the differences caused by the composition of the surface on which the laser beam is irradiated, it can be assumed (determined) that the surface of the etching stop layer has been exposed when the wavelength of the photoluminescence light is shortened. Neither Nakamura or the Chen article teach or suggest this feature. Specifically, the Chen articles discloses:

> "We use the photoluminescence (PL) technique to study the optical quality of the etched GaN surface"

at page 649, right column (lines 14-15).

However, Chen fails to teach or suggest the presently claimed phenomenon that the measured wavelength of the photoluminescence light is shortened when the amount of Al on the surface of the semiconductor irradiated by the laser beam increases, and utilizing this phenomenon to assume (determine) the surface of the etching stop layer has been exposed.

The Chen article also discloses:

"We observed a wavelength shift of the yellow luminescence (YL) peak"

in page 649, right column (lines 13-14). However, the authors fail to disclose the relationship between the wavelength shift of the yellow luminescence (YL) peak and the nitride semiconductor composed of AlGaN. Additionally, according to the "Ti/Al" layer disclosed at page 649, right column (line 16), it is obvious that "Ti/Al" is a metal layer and not a nitrided semiconductor composed of AlGaN. Since both Nakamura and the Chen article fail to disclose the above features of amended claim 11, a *prima facie* case of obviousness, under § 103(a), has not been set forth, and claim 11 is therefore patentable over the combination of teachings of Nakamura and Chen.

With regard to amended claim 12, by utilizing the differences caused by the composition of the surface on which the X ray is irradiated, it can be assumed (determined) that the surface of the etching stop layer has been exposed when the diffraction angle increases. Nakamura fails to teach or suggest the diffraction angle measured when the X ray irradiates; while the Chen article discloses:

> "Also, the near surface structure of GaN was studied by low angle X-ray diffraction"

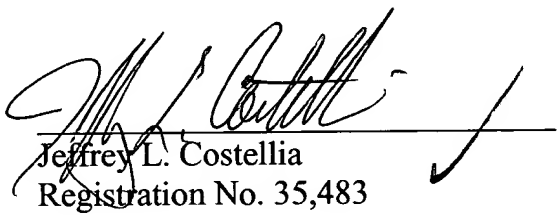
in page 649, right column (line 19) to page 650, left column (line 2). However, the Chen article fails to teach or suggest the phenomenon that the measured diffraction angle increases when the amount of Al on the surface of the semiconductor irradiated by the X ray increases, and fails to teach utilizing the phenomenon to assume (determine) that the

surface of the etching stop layer has been exposed. Since both Nakamura and the Chen article fail to disclose the above features of amended claim 12, a *prima facie* case of obviousness, under § 103(a), has not been set forth, and claim 12 is therefore patentable over the combination of teachings of Nakamura and Chen.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with Applicants' representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Lastly, it is noted that a separate Extension of Time Petition (one month) accompanies this response along with a check in payment of the requisite extension of time fee. However, should that petition become separated from this Amendment, then this Amendment should be construed as containing such a petition. Likewise, any overage or shortage in the required payment should be applied to Deposit Account No. 19-2380 (740819-703).

Respectfully submitted,



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